Positions and areas of sun spots—Continued

Date	Eastern standard civil time	Heliographic		Area		Total area for each day
		Longitude	Latitude	Spot	Group	
1927	h. m.	°	°			
Dec. 15 (Mount Wilson)	14 30	−64.0	+17.0	3		
		+18.0	+4.5		141	
		+56.0	−7.0		21	165
Dec. 16 (Mount Wilson)	18 0	+34.5	+5.0		136	
		+53.5	+13.0	12		
		+68.0	−8.0		19	167
Dec. 17 (Naval Observatory)	11 39	+44.0	+5.0	77		77
Dec. 18 (Naval Observatory)	11 51	+58.0	+5.0		62	62
Dec. 19 (Naval Observatory)	11 50	−14.0	+15.5	15		
		−11.0	+15.0	15		
		+70.0	+5.0		62	92
Dec. 20 (Naval Observatory)	11 42	−2.5	+15.5		15	
		+0.5	+15.0		31	46
Dec. 21 (Naval Observatory)	14 12	+14.0	+16.0		62	
		+17.5	+15.0		31	93
Dec. 22 (Naval Observatory)	13 10	+27.5	+16.0		15	
		+30.0	+14.5		46	61
Dec. 23 (Naval Observatory)	11 55	−21.5	+19.5		9	
		+13.0	−11.5		46	
		+13.5	+19.5		15	
		+24.0	−13.0		31	
		+40.0	+16.5		31	
		+42.0	+15.0		77	
		+46.0	+14.0	15		224
Dec. 24 (Naval Observatory)	11 45	−34.5	+10.5		46	
		−9.0	+20.5	12		
		−4.5	+19.0	6		
		+10.5	−13.0		62	
		+23.5	−11.0	46		
		+29.5	−11.5		37	
		+53.0	+17.0		46	
		+56.0	+15.0		77	
		+60.0	+14.0	15		347
Dec. 25 (Naval Observatory)	11 46	−25.0	+14.0		93	
		−20.5	+11.0		31	
		+6.0	+20.0		6	
		+9.5	+19.0		9	

Positions and areas of sun spots—Continued

Date	Eastern standard civil time	Heliographic		Area		Total area for each day
		Longitude	Latitude	Spot	Group	
1927	h. m.	°	°			
Dec. 25 (Naval Observatory)	11 46	+22.0	−12.5		31	
		+27.0	−11.5		46	
		+37.5	−11.5		46	
		+43.0	−11.5		77	339
Dec. 26 (Naval Observatory)	11 42	−14.0	+14.5		93	
		−9.5	+13.0		31	
		−7.0	+13.0	108		
		−6.0	+10.0	9		
		+35.0	−12.5		31	
		+40.0	−11.0	62		
		+49.5	−11.5	37		
		+57.5	−11.5		62	433
Dec. 27 (Naval Observatory)	11 43	−72.5	−15.0	139		
		−0.5	+14.5		93	
		+3.5	+12.5		77	
		+8.0	+12.5	154		
		+54.0	−11.0	62		525
Dec. 28 (Naval Observatory)	11 38	−83.0	−9.0	216		
		−70.0	−5.0	46		
		−58.5	−15.5	139		
		+16.0	+15.5		31	
		+17.0	+13.0		93	
		+22.0	+12.5	185		
		+65.0	−11.0	62		772
Dec. 30 (Mount Wilson)	14 45	−54.0	−9.0		524	
		−42.0	−5.0	13		
		−31.0	−15.0	108		
		+46.0	+12.0		289	934
Dec. 31 (Mount Wilson)	14 30	−78.0	−9.0	57		
		−41.0	−9.0		463	
		−29.0	−5.0		6	
		−16.0	−15.0		152	
		+25.0	+8.0		14	
		+50.0	−13.0	4		
		+62.0	+12.0		227	923
Mean daily area for December						450

AEROLOGICAL OBSERVATIONS

By L. T. SAMUELS

Free-air temperatures were below normal at practically every level at all stations except Washington. (See Table 1.) Departures were exceptionally large at Ellendale and Broken Arrow. The consistent positive departures at Washington are in close agreement with those shown for this region in Chart 111, as are also the negative departures at the other stations.

As is generally the case when large negative temperature departures occur, the resultant winds contain a much greater northerly component than normally. This was especially pronounced in the lower levels at Ellendale where the largest temperature departures occurred. (See Table 2.) However, negative temperature departures are not always accompanied by an excess of northerly or a deficiency of southerly air movement. An inverse relationship is strikingly shown at Broken Arrow from 750 to 1,500 meters, inclusive, where the resultant winds contained a larger southerly component than normal, although the largest negative temperature departures for this station are found at these same levels. The monthly resultants at the other kite stations were close to normal.

The resultant wind movement as indicated by pilot balloon observations contained a north to west component at the 3,000-meter level over the entire country. At San Juan an easterly component prevailed in the monthly resultants from the surface to 4,500 meters.

Relative humidities averaged unusually high in the upper levels at the two southern stations, Broken Arrow and Groesbeck. This excess of relative humidity resulted in large positive vapor pressure departures in these regions. Both of these stations had a large number of cloudy days during the month.

TABLE 1.—*Free-air temperatures, relative humidities, and vapor pressures during December, 1927*

TEMPERATURE (° C.)

Altitude, m. s. l. (meters)	Broken Arrow, Okla. (233 meters)		Due West, S. C. (217 meters)		Ellendale, N. Dak. (444 meters)		Groesbeck, Tex. (141 meters)		Royal Center, Ind. (225 meters)		Washington, D. C.* (7 meters)	
	Mean	Departure from 10-year mean	Mean	Departure from 7-year mean	Mean	Departure from 10-year mean	Mean	Departure from 10-year mean	Mean	Departure from 10-year mean	Mean	Departure from 3-year mean
Surface	0.6	−3.6	5.9	−2.3	−19.0	−9.1	7.5	−1.6	−3.4	−1.5	4.9	+2.7
250	0.5	−3.7	5.8	−2.3			7.1	−1.8	−3.6	−1.6	3.9	+2.4
500	−0.3	−4.0	5.4	−2.4	−18.5	−8.7	6.5	−1.9	−4.6	−1.4	2.8	+2.4
750	−1.4	−4.9	5.5	−2.1	−15.9	−7.2	6.2	−2.0	−4.8	−1.1	1.9	+2.3
1,000	−1.9	−5.8	5.2	−2.0	−13.1	−5.7	6.7	−1.7	−5.0	−1.3	1.2	+2.1
1,250	−1.6	−5.8	4.7	−1.9	−11.9	−5.1	6.4	−1.7	−5.4	−1.8	0.6	+2.0
1,500	−1.0	−5.0	4.4	−1.4	−11.7	−4.9	5.5	−2.0	−5.7	−2.0	0.4	+2.1
2,000	−1.1	−3.9	3.5	−0.7	−12.1	−4.2	4.5	−1.5	−6.6	−1.7	−0.3	+2.2
2,500	−2.9	−3.6	1.7	−0.6	−13.7	−3.8	3.5	−0.5	−7.7	−1.0	−2.1	+2.0
3,000	−4.8	−3.2	−0.1	−0.4	−16.1	−3.7	1.4	−0.3	−9.5	−0.6	−4.5	+1.9
3,500	−6.7	−2.8	−0.7	+1.1	−17.6	−2.5	−0.5	+0.3	−12.3	−0.7	−7.1	+1.9
4,000	−10.2	−3.5	−2.7	+1.9			−3.1	+0.4	−15.5	−0.7	−10.2	+1.9
4,500	−13.8	−4.2					−5.6	+0.3	−18.4	−0.6		
5,000									−21.3	−0.6		

RELATIVE HUMIDITY (%)

Surface	65	−5	72	−1	80	−1	66	−8	80	0	66	−1
250	65	−5	71	−1			64	−8	80	0	65	0
500	60	−4	65	−1	78	−1	62	−6	77	−1	63	−1
750	58	−1	61	−2	71	−1	62	−2	73	−1	62	−1
1,000	57	+4	59	−2	65	0	55	−2	67	0	59	−1
1,250	53	+6	61	+1	63	+2	52	−1	62	+1	58	−1
1,500	50	+7	60	+2	61	+3	52	+3	58	0	53	−4
2,000	49	+11	60	+6	59	+4	51	+9	51	−3	49	−6
2,500	53	+16	48	−1	57	+2	55	+16	51	−2	49	−6
3,000	53	+16	45	+2	58	+4	57	+20	51	−2	53	−2
3,500	44	+8	42	−1	67	+13	57	+27	44	−9	56	+1
4,000	56	+20	38	−5			65	+29	46	−11	58	+1
4,500	66	+29					63	+27	38	−23		
5,000									31	−23		

VAPOR PRESSURE (MB)

Surface	5.03	−1.29	7.54	−1.10	1.09	−1.55	8.27	−1.25	4.15	−0.42	6.48	+1.28
250	5.00	−1.27	7.44	−1.10			7.98	−1.20	4.10	−0.41	6.12	+1.21
500	4.51	−1.09	6.95	−0.92	1.12	−1.48	7.55	−0.88	3.78	−0.21	5.57	+1.08
750	3.79	−1.25	6.70	−0.69	1.32	−1.17	7.39	−0.37	3.77	+0.15	5.17	+0.95
1,000	3.55	−0.95	6.35	−0.49	1.45	−0.96	6.64	−0.28	3.42	+0.16	4.68	+0.80
1,250	3.26	−0.68	6.16	−0.21	1.49	−0.83	5.96	−0.21	3.05	+0.10	4.34	+0.71
1,500	3.21	−0.35	5.81	0.00	1.51	−0.69	5.49	+0.09	2.71	0.00	3.79	+0.45
2,000	3.14	+0.25	4.90	+0.16	1.37	−0.52	5.11	+1.00	2.21	−0.06	3.18	+0.26
2,500	2.99	+0.56	3.60	−0.20	1.16	−0.43	4.97	+1.70	2.06	+0.10	2.83	+0.29
3,000	2.73	+0.65	3.08	+0.09	0.95	−0.32	4.58	+1.92	1.85	+0.14	2.58	+0.58
3,500	2.27	+0.46	2.91	+0.27	0.98	0.00	4.24	+2.16	1.34	−0.12	2.30	+0.82
4,000	2.03	+0.46	2.63	+0.48			4.15	+2.23	1.17	−0.07	2.10	+0.82
4,500	1.83	+0.48					3.91	+2.21	0.91	−0.09		
5,000									0.74	−0.09		

* Naval air station, Anacostia, D. C.

AEROLOGICAL OBSERVATIONS FOR 1927

By L. T. SAMUELS

From Table 1 it will be seen that the temperatures for the year averaged above normal except at Ellendale where departures were negative at all levels; also at and near the surface at Broken Arrow, Due West, and Royal Center where small deficiencies occurred. The departures for Washington are based on the Mount Weather, Va., records covering a five-year period (July 1, 1907–June 30, 1912). Those below the 1,500-meter level have been omitted on account of the difference in elevation between these two stations and the fact that the Mount Weather data are based on the means of the ascents and descents of kite flights, whereas the airplane data represent ascents only. Above 1,500 meters, however, the effects of these differences are believed to be insignificant.

The relative humidity departures varied, in general, inversely as did those for temperature and were small and unimportant, the large value occurring at 5,000 meters at Due West being due to an insufficient number of observations for a reliable mean for 1927.

Vapor pressure departures were mostly positive, in agreement with those for temperature.

Minimum free-air temperature records were broken at Ellendale, Royal Center, and Naval Air Station on June 4, 5, and 6, respectively, and again on the 15th and 16th at Royal Center, Naval Air Station, and Due West when high-pressure areas passed over these stations.

The resultant wind directions during the year were as follows: January, February, and October, close to normal; March close to normal, except an excess of southerly winds at Due West and Ellendale; April, an excess of southerly winds at all stations, especially Royal Center and Ellendale; May and July, an excess of northerly winds at the northern stations and southerly winds at the southern stations; June and December, close to normal except at Ellendale where a northerly component predominated; August, an excess of northerly winds except at Due West and Ellendale which were close to normal; September, close to normal except Ellendale where an easterly instead of westerly component predominated in the lower levels; November, close to normal except an excess of northerly winds at Ellendale and southerly winds at Groesbeck and a subnormal northerly component at Washington.

TABLE 2.—*Free-air resultant winds (m. p. s.) during December, 1927*

Altitude m. s. l. meters	Broken Arrow, Okla. (233 meters)				Due West, S. C. (217 meters)				Ellendale, N. Dak. (444 meters)				Groesbeck, Tex. (141 meters)				Royal Center, Ind. (225 meters)				Washington, D. C. (34 meters)			
	Mean		10-year mean		Mean		7-year mean		Mean		10-year mean		Mean		10-year mean		Mean		10-year mean		Mean		7-year mean	
	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.	Dir.	Vel.
Surface	W.	2.0	S. 63°W.	1.1	N. 32°E.	0.7	S. 70°W.	1.2	N. 34°W.	3.9	N. 52°W.	3.4	N. 14°E	0.8	N. 61°W.	1.0	S. 40°W.	2.5	S. 56°W.	2.3	N. 42°W.	2.6	N. 43°W.	1.5
250	W.	2.1	S. 57°W.	1.3	N. 34°E.	0.7	S. 61°W.	1.3					S. 66°E.	0.8	S. 85°W.	1.1	S. 42°W.	2.8	S. 54°W.	2.6	N. 62°W.	5.4	N. 63°W.	3.7
500	S. 58°W.	2.8	S. 48°W.	3.0	S. 44°W.	0.6	S. 64°W.	3.2	N. 33°W.	4.2	N. 58°W.	3.8	S. 8°E.	2.1	S. 57°W.	2.4	S. 52°W.	5.1	S. 60°W.	5.4	N. 68°W.	7.7	N. 67°W.	6.0
750	S. 48°W.	3.6	S. 53°W.	3.7	S. 69°W.	2.3	S. 70°W.	4.9	N. 27°W.	4.6	N. 56°W.	5.6	S. 30°W.	2.2	S. 58°W.	3.4	S. 62°W.	6.2	S. 69°W.	7.1	N. 68°W.	7.8	N. 69°W.	7.6
1,000	S. 61°W.	4.1	S. 66°W.	4.5	S. 71°W.	3.6	S. 77°W.	6.4	N. 34°W.	4.1	N. 56°W.	6.6	S. 47°W.	3.5	S. 60°W.	4.6	S. 70°W.	7.3	S. 79°W.	8.3	N. 63°W.	8.2	N. 68°W.	8.9
1,250	S. 69°W.	5.6	S. 78°W.	5.1	S. 67°W.	6.3	S. 76°W.	7.9	N. 45°W.	4.1	N. 58°W.	7.3	S. 63°W.	4.4	S. 67°W.	5.7	S. 76°W.	8.6	S. 83°W.	9.8				
1,500	S. 69°W.	6.6	S. 79°W.	6.0	S. 69°W.	10.2	S. 82°W.	9.6	N. 49°W.	4.9	N. 57°W.	8.1	S. 57°W.	5.4	S. 68°W.	6.6	S. 79°W.	10.7	S. 88°W.	10.9	N. 52°W.	10.1	N. 69°W.	11.2
2,000	N. 88°W.	9.0	S. 84°W.	7.4	S. 80°W.	11.6	S. 84°W.	11.5	N. 60°W.	6.7	N. 59°W.	9.8	S. 78°W.	5.6	S. 74°W.	7.8	N. 84°W.	11.7	N. 88°W.	12.6	N. 67°W.	11.1	N. 71°W.	12.8
2,500	N. 76°W.	12.6	N. 88°W.	9.7	S. 81°W.	13.7	S. 88°W.	11.9	N. 70°W.	9.7	N. 62°W.	11.6	S. 73°W.	8.9	S. 77°W.	9.6	N. 78°W.	12.0	N. 85°W.	14.3	N. 70°W.	13.5	N. 74°W.	15.4
3,000	N. 79°W.	14.2	N. 89°W.	11.0	S. 78°W.	18.1	N. 87°W.	13.8	N. 72°W.	12.0	N. 65°W.	13.1	S. 79°W.	12.8	S. 78°W.	11.4	N. 75°W.	11.6	N. 88°W.	14.2	N. 78°W.	13.3	N. 76°W.	16.5
3,500	N. 87°W.	17.2	N. 88°W.	12.6	S. 68°W.	14.0	N. 85°W.	14.0	N. 74°W.	16.7	N. 71°W.	14.8	S. 87°W.	14.7	S. 80°W.	12.0	N. 73°W.	9.2	N. 84°W.	13.3	N. 78°W.	16.6	N. 69°W.	18.0
4,000	S. 77°W.	15.7	N. 85°W.	12.1	S. 68°W.	16.0	N. 80°W.	12.9	N. 59°W.	26.1	N. 71°W.	14.0	N. 78°W.	19.4	S. 84°W.	12.0	N. 56°W.	7.2	S. 72°W.	11.6	N. 73°W.	16.3	N. 69°W.	18.5
4,500	S. 77°W.	16.2	N. 86°W.	12.8									N. 45°W.	17.0	N. 83°W.	12.2	W.		S. 64°W.	7.8	N. 74°W.	15.7	N. 75°W.	20.4
5,000																	W.				N. 68°W.	16.7	N. 70°W.	18.8